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The attached documents are exact copies of the European patent application described on the following page, as originally filed.

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Patentanmeldung Nr. Patent application No. Demande de brevet n°

99250139.5

PRIORITY DOCUMENT

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Blatt 2 der Bescheinigung
Sheet 2 of the certificate
Page 2 de l'attestation

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DEUTSCHE THOMSON-BRANDT GMBH
78048 Villingen-Schwenningen
GERMANY

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TRICKPLAY SUPPORT PROPOSAL

The invention relates to an improved trickplay support concept for a data stream recorder, in particular a DVD based data stream recorder.

This proposal describes a way to realize Access Units (AU). The resulting AUs have a resolution range from "2 SOBUs" up to "application packet" exact. The precision depends on the used DVD Streamer, i.e. whether the DVD Streamer knows the application and how much RAM memory is available and so on. With other words: the precision is manufacture matter.

Principle

Each SOB contains its own AU data (AUD). This AUD consists of a general information, one or two coarse lists and one or two fine lists.

The coarse list is called the Access Unit Start Map (AUSM). The AUSM consists of N flags (N is the number of SOBUs of this SOB). Each flag belongs to one SOBU. The flag indicates

- into the corresponding SOBU or into the next SOBU points an AU
- no corresponding AU exists for that flag

The fine list is called the Access Unit Location List (AULL). The AULL contains the application packet exact locations of all AUs. For each AU indicating AUSM/AUEM flag exists one location information inside AULL. Two kind of AULLs exist:
The part inside AULL which contains the start location is called the Access Unit Start Location List (AUSLL).
The part inside AULL which contains the end location is called the Access Unit End Location List (AUELL).

The complete AU information of an SOB consists of either

- the sector & application packet location of the start of the AU and
- the sector & application packet location of the end of the data which starts at the AU (e.g. the end of the I-frame) and
- the PTS of the AU

or

- the start APAT of the AU
- the end APAT of the AU (e.g. the end of the I-frame) and
- the PTS of the AU

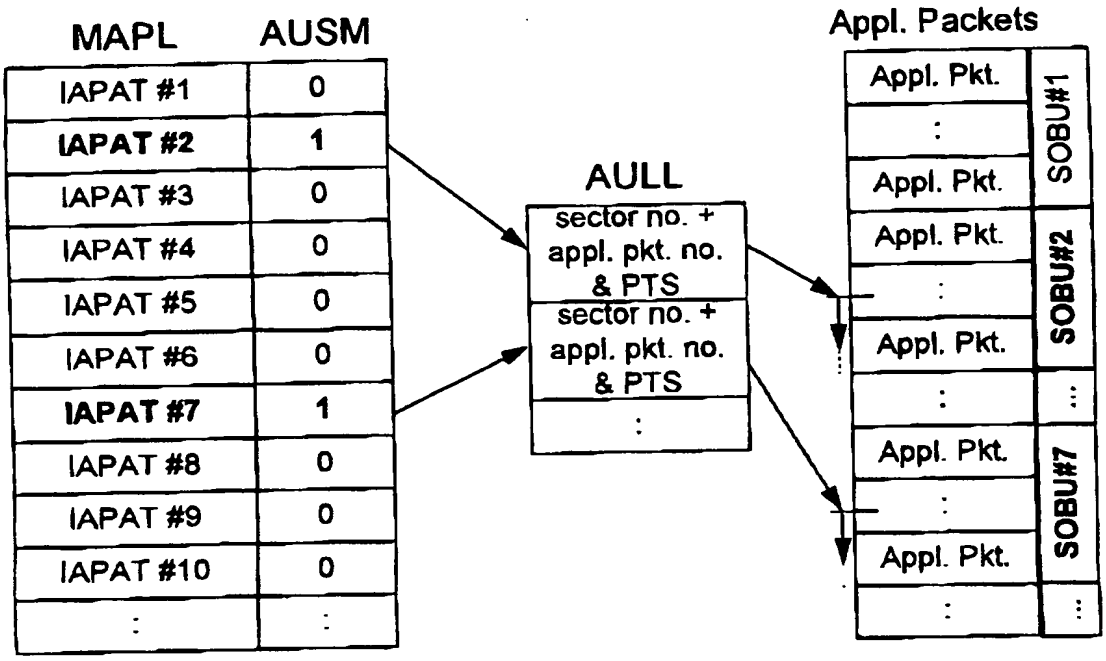
or

- the start ATS of the AU
- the Access Unit End Map (AUEM) of the AU (for the end ATS of the AUs)
- the end ATS of the AU, based on AUEM, not AUSM and
- the PTS of the AU

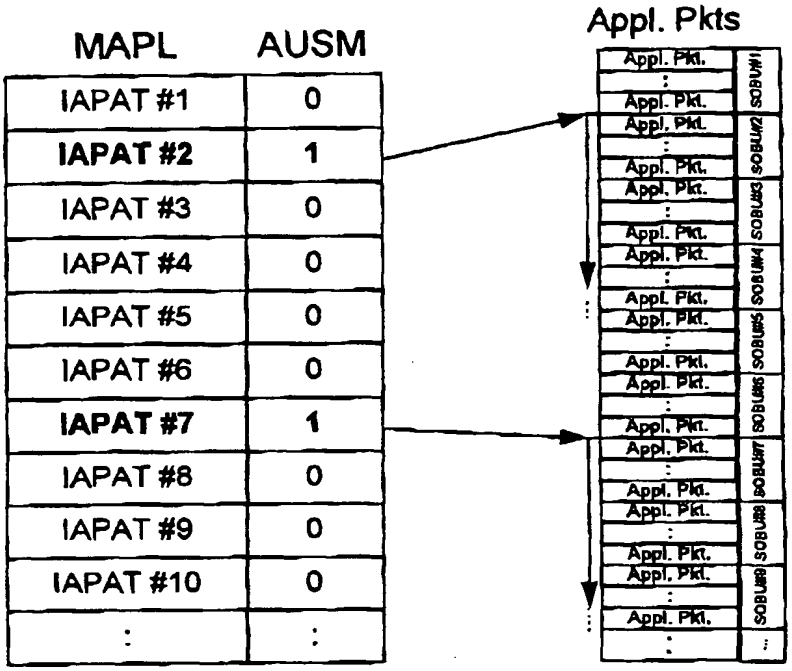
The trickplay (e.g. fast forward) will be performed by selecting the desired AUs (e.g. each second AU) via AUSM/AUEM.

The generating of AUSM, AUEM, AUSLL and AUELL during SOB recording is optional (manufacture matter). The use of AUSM, AUEM, AUSLL and AUELL for trickplay is also optional (manufacture matter). It's mandatory to update the AUSM/AUEM and AULL in the case of editing.

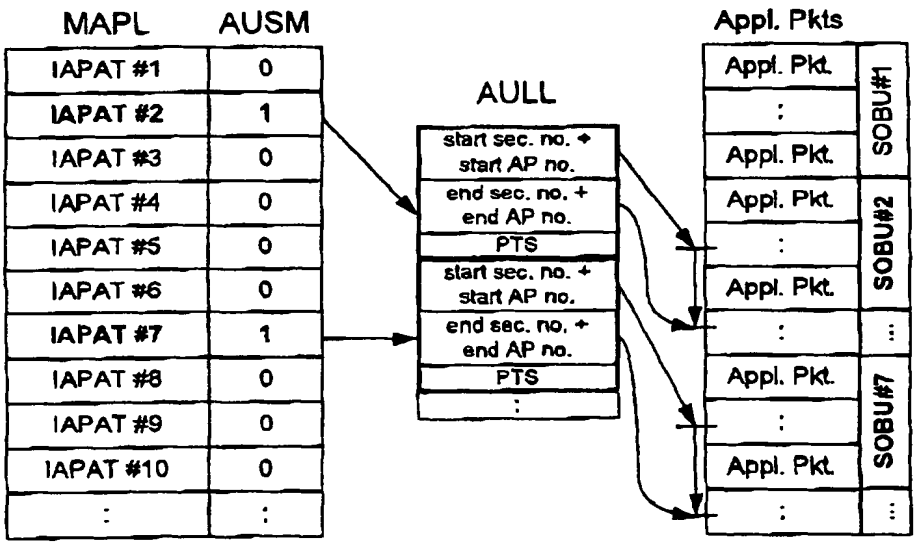
Three examples:



Access via AUSM and AULL



Access via AUSM, but without AULL



AULL also contains end of AU information

Generating of AUSM and AULL

The DVD Streamer specification shall define the syntax of the AUs, not the generating or using of the AUs. However, here are some possible example methods to generate AUSM/AUEM and AULL:

- **Method 1:** the application sends after transmission of the stream special data which contains a list of AU as APATs, i.e. each APAT of the list is the

THO's revised Trick Play Support proposal

The DVD Streamer Format Draft Ver 0.3 realizes Trick Play support by the "Entry Point Data" of Section 2.2.3.3.3. THO has now revised this part of the draft to take into account the following outcomings of TG1-3:

- The "Sector based" addressing mechanism has been deleted. This reflects the majority of TG1-3 opinion from the last meeting.
- The wordlength of the "time based" addressing information has been changed from a 6 Byte time value of the APAT type to a 4 Byte time value of the ATS type. As a side effect, a second bit flag array "AUEM" had to be introduced in parallel to the already existing "AUSM". In this new format, the time based address information is not only more compact, but also more directly usable. This is a THO-originated improvement since the last meeting.
- All "Entry Point ..." terms have been renamed to "Access Unit ...", in order to avoid confusion with the user controlled Entry Points in Cell Information, which still exist. This change reflects a desire of TG1-3 to improve naming, and some suggestions thereon.

In the following, the revised Sections of Chapter 2 are given.

2.2.3.3 Stream Object Information (SOBI)

As shown in Figure 2-6, a Stream Object information (SOBI) consists of the Stream Object Information General Information (SOBI_GI), the Mapping List (MAPL) *and the Access Unit Data (AUD), if any.*

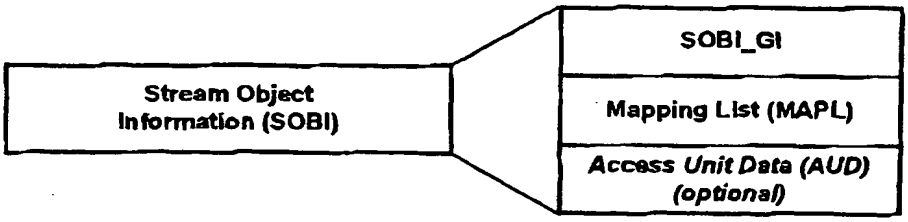


Figure 2-6: Structure of a Stream Object Information

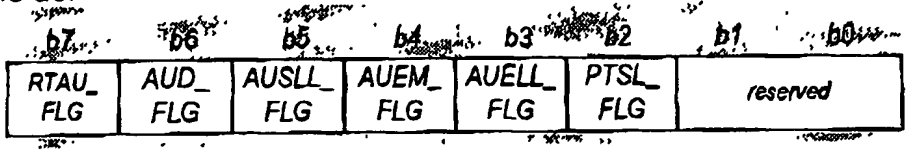
2.2.3.3.1 Stream Object Information General Information (SOBI_GI)

	Contents	Number of Bytes
(1) SOB_TY	SOB Type	1
(2) SOB_REC_TM	SOB Recording Time	5
(3) SOB_STI_N	SOB Stream Information Number	1
(4) AUD_FLAGS	***Access Unit Data Flags***	***1***
(5) SOB_S_APAT	SOB Start APAT	6
(6) SOB_E_APAT	SOB End APAT	6
(7) SOB_S_SOBU	first SOBU of this SOB	4
(8) MAPL_ENT_Ns	number of Mapping List entries	4
	Total	28

<...>

(4) AUD_FLAGS

Indicates whether and what kind of Access Unit Data exist for this SOB. If Access Unit Data exist, then AUD_FLAGS also describes several properties of the Access Unit Data. The Access Unit Data itself (described in Section 2.2.3.3.3) consists of the number of Entry Points and the tables AUSM, AUSLL, AUEM, AUELL and PTSLL. The content of AUD_FLAGS is as:



RTAU_FLG ... 0b: no AU flags exist inside the RT Data of this SOB
1b: AU flags, as described in Section 3.3.2.2, may exist inside the RT Data of this SOB. This state is even allowed, when no further Access Unit Data exist for this SOB, i.e. when AUD_FLG=0b.

AUD_FLG ... 0b: no Access Unit Data exist for this SOB. The bits b5, b4, b3 and b2 of EP_FLAGS shall be set to 0.
1b: Some Access Unit Data (as further specified by the subsequent flags) exist for this SOB (behind the MAPL).

AUSLL_FLG ... 0b: no AUSLL of this SOB exists
1b: AUSLL of this SOB exists

AUEM_FLG ... 0b: no AUEM of this SOB exists. AUELL_FLG must then also be set to 0b.
1b: AUEM of this SOB exists

AUELL_FLG ... 0b: no AUELL of this SOB exists
1b: AUELL of this SOB exists. Is only allowed when AUEM_FLG =1b.

PTSL_FLG ... 0b: no PTSL of this SOB exists
1b: PTSL of this SOB exists

<...>

2.2.3.3.3 Access Unit Data

As shown in Figure 2-9, the Access Unit Data (AUD), if any, consists of the Access Unit General Information (AU_GI), the Access Unit Start Location List (AUSLL), the Access Unit End Map (AUEM), the Access Unit End Location List (AUELL) and the Presentation Time Stamp List (PTSL). Which of these parts exist is indicated by AUD_FLAGS of SOBI_GI, see Section 2.2.3.3.1.

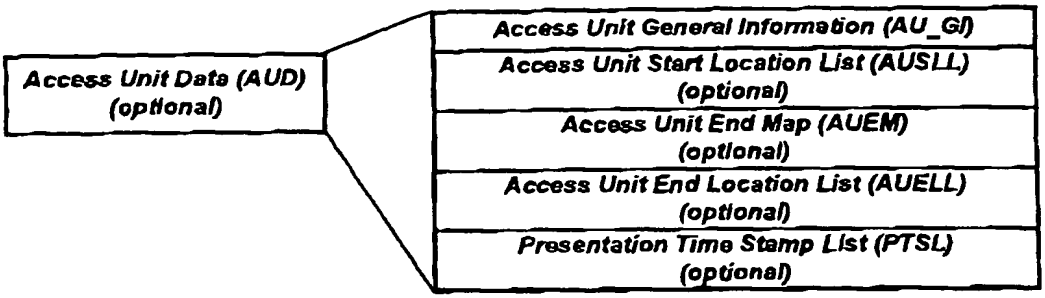


Figure 2-9: Structure of the Access Unit Data

2.2.3.3.3.1 Access Unit General Information (AU_GI)

AU_GI only exists, when AUD_FLAGS of SOBI_GI indicates that Acess Unit Data exist.

	Contents	Number of Bytes
(1) AU_Ns	number of Access Units	4
(2) AUSM	Access Unit Start Map (MAPL_ENT_Ns entries)	(MAPL_ENT_Ns+7) div 8
	Total	4+(MAPL_ENT_Ns+7) div 8

(1) AU_Ns

Describes the number of Access Units described for this SOB. At the same time, AU_Ns describes the number of locations, where AUSM indicates the existence of an Access Unit.

(2) AUSM

The Access Unit Start Map indicates which of the SOBUs of this SOB contain Access Units. For each SOBU of the SOB, exactly one AUSM entry exists. So, the AUSM consists of MAPL_ENT_Ns entries. Each AUSM entry indicates an accessable Access Unit somewhere within the corresponding SOBU, or within the subsequent SOBU. Exactly AU_Ns Access Units are indicated by the AUSM, equivalent to exactly AU_Ns bits of AUSM being equal to 1b.

AUSM shall be byte aligned. If the concatenated AUSM entries consists of a number of bits which is not an integer multiple of 8, then the remaining LSBs of the last byte of the AUSM shall be the necessary additional padding bits. These alignment bits shall be set to 0.

Figure 2-10 shows an example of an AUSM and its corresponding SOBUs.

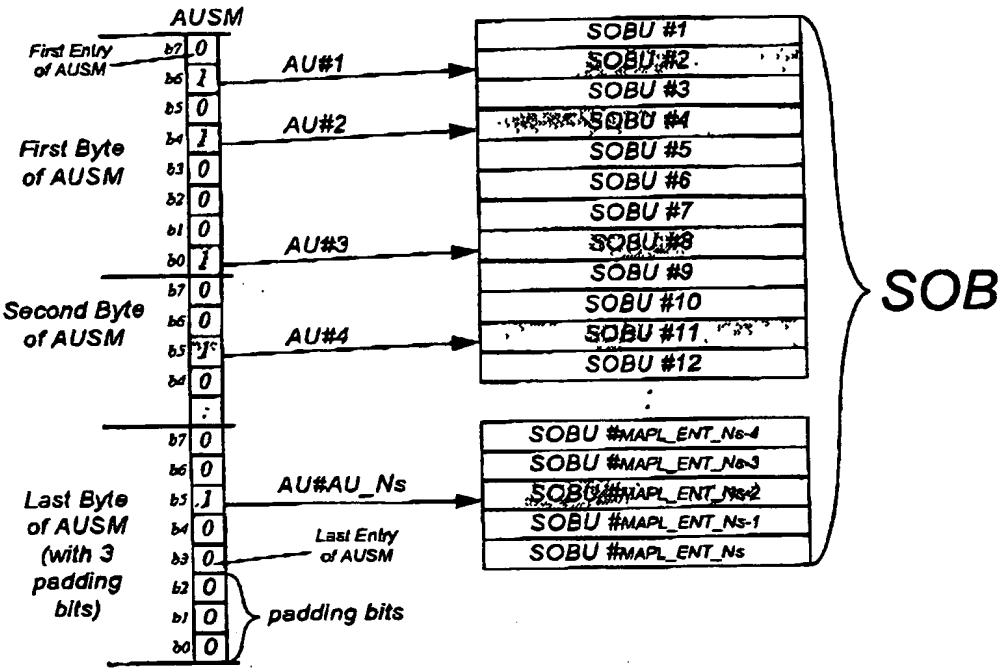


Figure 2-10: Example of an AUSM and its corresponding SOBUs

NB: With this kind of Access Unit Data, no more than one addressable Access Unit can be described per each SOBU of the SOB.

2.2.3.3.3.2 Access Unit Start Location List, Access Unit End Map and Access Unit End Location List (AUSLL, AUEM and AUELL)

AUSLL is a list of location information to find the application packet where the bitstream segments of the Access Units start. Therefore, if AUSLL exists, then each Access Unit as marked in AUSM has exactly one AUSLL entry associated to it.
AUEM, if it exists, is a bit array of the same length as AUSM. The bits in AUEM indicate, which of the SOBUs contain the end of the bitstream segment associated with the Access units of the SOB. The number of bits set in AUEM must be equal to the number of bits set in AUSM.
AUELL, if it exists, is a list of location information to find the exact application packet where the bitstream segments of the Access Units stop. Therefore, if AUELL exists, then each Access Unit as marked in AUEM has exactly one AUELL entry associated to it. Each application packet, indicated by the AUELL entries, is the last application packet belonging to the Access Unit.
The entries of AUSLL and AUELL are in ascending order, i.e.

- *the first AUSLL/AUELL entry is associated to the SOBU number, where AUSM/AUEM - read from left to right - has a bit set to 1b for the first time*
- *the second AUSLL/AUELL entry is associated to the SOBU number, where AUSM/AUEM - read from left to right - has a bit set to 1b for the second time*
- *and so on*

2.2.3.3.3.3 Entries of AUSLL and AUELL

The entries of AUSLL and AUELL are time based, i.e. their entries are defined as

Note that except for the files described above, the STRREC directory shall not contain any other files or directories.

Stream Data include one or more 'Stream Objects' (SOBs) which each can be stored as a 'Program stream' as described in ISO/IEC 13818-1, Systems.
A SOB can be terminated by a program_end_code. The value of the SCR field in the first pack of each SOB may be non-zero.
A SOB contains the Stream Data packed into a sequence of 'Stream Packs' (S_PCKs). Stream data can be organised as one elementary stream and are carried in PES packets with a stream_id.
In Stream recording, the application performs its own padding so that the pack length adjustment methods of DVD-ROM Video or RTRW need not to be used. In Stream recording it is safe to assume, that the Stream packets will always have the necessary length.

The new trick play support proposal is based on the former proposal filed in the European Patent application 99250083.5 of the applicant. Therein, the structure of SOB_GI is described in detail. Most of the components of SOB_GI remain unchanged also in the new proposal and need not be explained in detail here. The information entry (4) EP_FLAGS has been replaced by the information entry (4) AUD_FLAGS explained above. The information item (8) IAPAT_SUM_INIT is deleted from the SOB_GI in the new proposal. The structure of the SOBI also has been revised. Instead of Entry Point Data Access Unit Data is inserted in SOBI. This new type of data and its application is also explained above.

Claims

1. Method for implementing trickplay modes in a data stream recorder, and corresponding recorder, wherein access units are added to the bitstream to be recorded and wherein said access units contain items of information like general information, start location list, end location list and presentation time stamp list which are used for the trickplay modes.

2. Method or recorder according to claim 1, wherein said trickplay modes include fast forward, fast reverse, slow motion, single picture step and/or still picture.

1/1

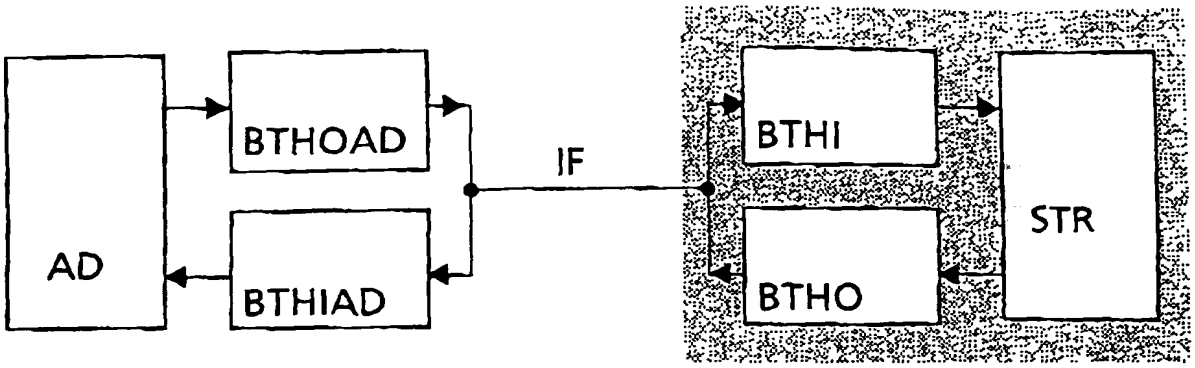


Fig.1